

REMARKS

With entry of the foregoing Amendment, claims 1-22 are currently pending in the application, as amended. Claims 5-22 have been withdrawn as being drawn to a non-elected species. Claim 1 has been amended to incorporate subject matter of original claim 2. Claims 2 and 4 have been amended to be consistent with the amendment to claim 1. Support for the amendment to claim 1 can be found in at least the original claims, Fig. 1 and paragraph [0054] of the published application. Accordingly, no new matter has been added.

Applicants respectfully request that the Amendment After Final be entered in accordance with M.P.E.P. § 714.13 and 37 C.F.R. § 1.116 because: (1) no new matter has been added to the application by the Amendment After Final; (2) the Amendment After Final addresses and resolves all issued raised by the Examiner in the final Office Action; (3) the subject matter of the Amendment After Final has already been included in the Examiner's search and, therefore, does not require the Examiner to perform further searching; (4) the Amendment After Final places the application in condition for allowance or in better form for appeal and (5) the Amendment After Final does not result in a net addition to the claims of the application.

Claim Rejections – 35 U.S.C. § 103

Claims 1-4 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Application Publication No. 2003/0054912 A1 (Nohara). The Examiner admits that Nohara fails to disclose that a total gear ratio of a first stage speed reducing portion and a second speed reducing portion is set to 1/6 to 1/160, or a reduction gear ratio of the eccentric oscillating-type speed reduction mechanism is set to 1/50 to 1/40 or that a total reduction gear ratio of the speed reducer is 1/1000 to 1/3000 such that a total efficiency of the speed reducer is 77% or more. However, the Examiner asserts that it would have been obvious to modify the device of Nohara to employ the specific gear reductions. Applicants respectfully traverse the rejection of amended independent claim 1, and claims 2-4 that depend therefrom.

Section 2143.03 of the MPEP requires the “consideration” of every claim feature in an obviousness determination. To render a claim unpatentable, however, the Office must do more than merely “consider” each and every feature for this claim. Instead, the asserted combination of the patents must also teach or suggest each and every claim feature. See *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974) (emphasis added) (to establish *prima facie* obviousness

of a claimed invention, all the claim features must be taught or suggested by the prior art). A proper obviousness determination requires that an Examiner make “a searching comparison of the claimed invention – including all its limitations – with the teaching of the prior art.” *See In re Wada and Murphy*, Appeal 2007-3733, citing *In re Ochiai*, 71 F.3d 1565, 1572 (Fed. Cir. 1995) (emphasis in original). Moreover, as the Supreme Court recently stated, “there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR Int'l v. Teleflex Inc.*, 127 S. Ct. 1727, 1741 (2007) (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (emphasis added)).

Referring to Fig. 1, Nohara discloses an eccentric oscillating-type speed reducer 69 which makes it possible to make a final speed reduction ratio and a final output torque substantially large by enlarging the reduction ratio based on the driving and driven external gears (paragraph [0005] of the published application). The speed reducer 69 includes an output shaft 46 extending vertically from a drive motor 45 and an intermediate shaft 47 connected to a lower end of the output shaft 46. Furthermore, a sun gear 49 is located at a lower end of the intermediate shaft 47 (paragraph [0031] of the published application). In operation, rotation of the output shaft 46 is subjected to speed reduction by the intermediate shaft 47 (paragraph [0033] of the published application)

Amended independent claim 1 of the present application is directed to a speed reducer used in a yaw drive apparatus of a wind power generation apparatus and recites as follows:

a first stage speed reducing portion;
a second stage speed reducing portion connected to the first speed reducing portion, a total reduction gear ratio of the first stage speed reducing portion and the second stage speed reducing portion is set to 1/6 to 1/60;
a third stage speed reducing portion;
the first stage speed reducing portion is constructed by a planetary speed reduction mechanism including an input sun gear which is fixedly connected to an output shaft of a motor,
a plurality of planetary gears engaged with a periphery of the input sun gear, an internal gear member having internal teeth engaged with peripheries of the planetary gears and a carrier rotatably supporting the planetary gears;
the third stage speed reducing portion is constructed by an eccentric oscillating type speed reduction mechanism comprising an internal gear member in which a number of internal teeth are formed at the internal periphery thereof, a plurality of external

gears which are received in the internal gear member, which have external teeth engaged with the internal teeth and having a number of teeth less than the number of the internal teeth at the external periphery thereof, and which are disposed in parallel to each other in the axial direction, a plurality of crank shafts which are rotatably inserted into the plurality of external gears, and which are connected to the second stage speed reducer and rotate to eccentrically rotate the plurality of external gears, and a carrier which rotatably supports both ends of the crank shafts, and

a reduction gear ratio of the eccentric oscillating-type speed reduction mechanism is set to 1/50 to 1/140, and wherein

the total reduction gear ratio of the speed reducer is set to 1/1000 to 1/3000 such that a total efficiency of the speed reducer is 77% or more.

[Emphasis added]

Applicants respectfully submit that even if Nohara were modified to include the specific gear ratios of claim 1, Nohara would still fail to disclose, teach or even suggest each and every element of amended independent claim 1. Specifically, Nohara does not disclose, teach or even suggest a planetary speed reduction mechanism including an input sun gear which is fixedly connected to an output shaft of a motor, as is recited in amended independent claim 1. In contrast, Nohara explicitly discloses that the sun gear 49 is connected to the intermediate shaft 47, not fixedly connected to the output shaft 46 of the motor 45.

In a speed reducer, a general relationship between the output efficiency and the speed reduction rate can be described as the output efficiency is deteriorated when the speed reduction rate is designed to be high. The conventional speed reducer used in a yaw drive apparatus of a wind power generation apparatus, which requires a high reduction gear ratio, has been constructed by a five-stage planetary gear speed reducer. Available maximum efficiency in this conventional speed reducer was 77% at the most.

The speed reducer 69 of Nohara has mechanical loss due to the intermediate shaft 47, an oil seal 50 and a ball bearing 48. This mechanical loss comes from these elements that are generated in the input (driving) side mechanism. Accordingly, the loss that comes from these elements is amplified through the speed reduction mechanism before it is transmitted to the output member. Therefore, it is essentially impossible to reduce the mechanical loss significantly in Nohara.

In contrast, in the device recited in amended independent claim 1, the input sun gear 3 is fixedly connected to the output shaft 2 of the motor 1 so that the input of the motor 1 is directly

transmitted to the input sun gear 3. In addition to this direct connection between the motor 1 and the input sun gear 3, the reduction gear ratios are specifically limited in amended independent claim 1. That is, in the first and second speed reducing portions 10, 20, the reduction gear ratio is set to 1/6 to 1/60 and the reduction gear ratio of the eccentric oscillating-type speed reduction mechanism is set to 1/50 to 1/140. Applicants have found that an efficiency higher than 77% is obtained by this combination of the reduction gear ratios in addition to the structure of the first speed reducing portion recited in amended independent claim 1. Thus, the speed reducer of the amending independent claim 1 obtains a high gear reduction ratio while maintaining a high efficiency.

Applicants have applied this speed reducer to a yaw drive apparatus of a wind power generation apparatus, which requires high reduction gear ratio. Since the speed reducer provides high reduction gear ratio, it is possible to mount a motor with a relatively small output. Therefore, the total size of the yaw drive apparatus can be downsized, which can result in total weight reduction of the wind power generation unit (nacelle). Further, the downsized yaw drive apparatus results in more flexible arrangement of devices within the nacelle.

When a strong gust of wind is subjected to the windmill, the nacelle can be turned more smoothly due to the high efficiency of the speed reducer. As a result, damage of the windmill by the gust of wind can be suppressed more reliably. The nacelle of the windmill are often operated in low temperature due to cold weather and wind. In this case, viscosity of the lubrication oil becomes high and the turning of the nacelle could become more resistant. Because of the high efficiency of the speed reducer recited in amended independent claim 1, the nacelle can be turned more smoothly than a windmill in which the conventional speed reducer is installed.

Based on the above, Applicants respectfully submit that the combination of structure, gear ratios and total efficiency recited in amended independent claim 1 is not obvious over Nohara because Nohara fails to disclose each and every structural element of amended independent claim 1 and the specific structure, gear ratios and total efficiency would not have been obvious. Thus, Applicants respectfully submit that amended independent claim 1 is not obvious over Nohara and request that the rejection under 35 U.S.C. § 103(a) be reconsidered and withdrawn. Further, Applicants respectfully submit that claims 2-4, which depend from amended independent claim 1, are not obvious over Nohara for at least the same reasons discussed above for claim 1.

CONCLUSION

In view of the foregoing Amendment and Remarks, Applicants respectfully submit that the present application, including claims 1-4, as amended, is in condition for allowance and such action is respectfully requested.

Respectfully submitted,

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